

PATENT SPECIFICATION

DRAWINGS ATTACHED

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COMPLETE SPECIFICATION

Dyed Textile Fibres and Fabrics Prepared therefrom

We, EASTMAN KODAK COMPANY, a Company organized under the Laws of the State of New Jersey, United States of America of 343, State Street, Rochester, New York 14650, United States of America do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

THIS INVENTION relates to dyeing textile fibres, particularly acrylic textile fibres, and to the use of the dyed fibres in the preparation of high-pile fabrics.

The manufacture of pile fabrics, particularly multi-pile fabrics, such as artificial fur, commonly involves the use of a mixture of two types of fibres, one of which is capable of shrinking independently of the other upon application of heat. The two types of fibres are combined into a high-pile fabric, and upon heating, the heat-shrinkable fibres undergo shrinkage leaving the heat-stable fibres at their original length. An artificial fur fabric closely resembling natural fur can be made in this manner, the longer fibres of the fabric appearing as the guard hairs and the fibres which have undergone shrinkage simulating the underfur of natural fur.

In manufacturing high-pile fabrics by the sliver knitting process, it is necessary to combine precoloured shrinkable and non-shrinkable fibres into the high-pile fabric prior to the heat treatment to differentially shrink the fibres, because ordinarily dyeing cannot be carried out after formation of the pile fabric. Solution dyed shrinkable acrylic and modified acrylic fibres are commonly used in fabrics of this type. Although it is desirable to dye shrinkable fibres by conventional stock dyeing techniques, this has not been possible since the shrinkable fibres undergo considerable

shrinkage in the dyeing operation because of the heat required to dye the fibres effectively. At lower dyeing temperatures at which shrinkage does not occur, synthetic fibres commonly have low affinity for dyes and shades of low tinctorial power and poor fastness are obtained.

Attempts have been made to pre-dye textile fibres, such as acrylic fibres, intended for use as the shrinkable component of the pile fabric, for example using tow dyeing methods, and then imparting the heat-shrinkage property to the coloured tow. However, this method has not been successful primarily because the dyed shrinkable fibres gradually lose their heat-shrink property on natural ageing, and processing characteristics of the resulting fibre are very poor.

According to the present invention, there is provided a process of dyeing textile fibres, which comprises dyeing heat-shrinkable fibres of an acrylonitrile polymer at a temperature below 160° F.

When performing the present invention, fibres composed of acrylonitrile polymers, modified so as to be dyeable at low temperatures, are treated to impart heat-shrinkage properties thereto, for example by heating, drafting and cooling the fibres without relaxing or further heat treatment. The so-formed heat-shrinkable fibres are dyed at a temperature below 160° F. Subsequent drying of the fibres should also be carried out at temperatures below that causing substantial loss of heat shrinkage, for example at 180° F. to 220° F. preferably at about 190° F. The heat-shrinkable fibres thus obtained are suitable for use as the heat-shrinkable component of a pile fabric.

Representative acrylonitrile polymers capable of bearing the high heat-shrinkable property imparted thereto and which, in the

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shrinkable form, can be expected to be readily dyeable without substantial loss of shrinkage are acrylonitrile homopolymers and copolymers including acrylonitrile-vinyl halide copolymers and acrylonitrile-vinylidene copolymers, which polymers have been modified to improve their dyeability by blending or otherwise incorporating into the polymer alkylacrylamide polymers such as poly-N-alkylacrylamides, acrylic ester polymers including polyethylacrylate and polymethylmethacrylate, polyvinylpyridines, poly(vinylpyrrolidones), polyvinyl acetals, e.g. polyvinylbutyral, epoxy resins, e.g. epichlorohydrinsulphide or epichlorohydrin-bis-phenol condensates, polyalkylimines, polycarbonates, polyoxyalkenes, divalent metal salts of aliphatic carboxylic acids, and metal sulphonates.

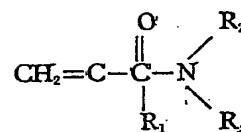
Such heat-shrinkable polymers are usually capable of as much as 35 to 45% linear shrinkage, and on dyeing at the low temperatures contemplated by the invention can be expected to lose no more than about 2 to 10% of their heat-shrinkage property, so that dyed fibres are readily obtainable possessing as much as 30 to 40% retained shrinkage. The shrinkage of the fibre before or after dyeing may be determined by placing a given length in boiling water for two minutes followed by quenching with cold water and measuring the change in length. More accurate results may be obtained by using samples of tow in the test before cutting it into short staple fibre lengths. Accordingly, by heat-shrinkable fibre, we mean fibre capable of 20% or more shrinkage on heating to elevated temperatures.

An especially useful group of polymers to which substantial heat-shrinkability can be imparted which is retained through dyeing at relatively low temperatures, are the acrylonitrile polymers and copolymers containing at least 35% and up to 95% acrylonitrile units, and modified by, for example, 85—5% of vinyl pyridine units as described in U.S. Patents 2,990,393 (Re. 25,533) and 3,014,008 (Re. 25,539) or modified by 65—5% of vinylpyrrolidone units, for example as described by U.S. Patent 2,970,783, or modified with 65—5% acrylic ester or acrylamide units as described in British Patent Specifications Nos. 781,434, 781,435 and 781,436. Similar amounts of the other polymeric modifiers mentioned above are also useful. The polymers retain a useful amount of shrinkage under conditions that lead to significant dyeing of the fibres.

A typical copolymer composition can be prepared as follows: 93 parts of acrylonitrile, 7 parts of 2-vinylpyridine, 1500 parts of water, 1.5 parts of ammonium persulphate, 1.5 parts of sodium metabisulphite, 10 parts of phosphoric acid, and 2.0 parts of sodium lauryl sulphate were heated at 40° C. for 15 hours. The resultant polymeric slurry, which

had an intrinsic viscosity in dimethyl formamide of 1.4, was washed and dried, and after solution in dimethylformamide, was spun under conditions that gave a fibre having an appreciable degree of residual shrink. This material could be dyed under conditions that gave a dyed fibre that still retained about 70% of its original shrinkage.

A preferred group of copolymers especially adapted to form heat-shrinkable fibres and which are readily dyeable at low temperatures without appreciable loss of shrinkage, are modacrylic polymers composed of a mixture of (A) 70—95% by weight of a copolymer of from 30 to 65% by weight of vinylidene chloride or vinyl chloride and 70—35% by weight of acrylonitrile, and (B) 30—5% by weight of a second polymer from the group consisting of (1) homopolymers of acrylamidic monomers of the formula:



wherein R₁ is hydrogen or methyl, and R₂ and R₃ are each hydrogen or an alkyl group of 1 to 6 carbon atoms (2) copolymers consisting of at least two of said acrylamidic monomers, and (3) copolymers consisting of at least 50% by weight of at least one of said acrylamidic monomers and not more than 50% by weight of a polymerizable monovinyl pyridine monomer.

A particularly efficacious group of modacrylic polymers for use in the low temperature dyeing process of the invention is an acetone soluble mixture of (A) 70—95% by weight of a copolymer of 30—65% by weight of vinylidene chloride and 70—35% by weight of acrylonitrile and (B) 30—5% by weight of an acrylamide homopolymer having the above formula wherein R₁, R₂, and R₃ are as described above. The acrylamide homopolymer is preferably a lower N-alkylacrylamide polymer such as poly-N-methylacrylamide, poly-N-isopropylacrylamide and poly-N-tertiarybutylacrylamide.

When preparing a high-pile fabric, the dyed heat-shrinkable fibres are knit or otherwise combined into a high-pile fabric having a knitted base together with dyed heat-stable (non-shrinkable) textile fibres after which heat can be applied to differentially shrink the fibres to produce a pile fabric such as a dual pile fabric resembling natural fur. The method of applying heat to the fabric to shrink the fibres is not critical, for example, hot air at a temperature not adversely affecting the fibres of the order of 250—300° F. can be applied thereto. In this process the combination of the specified shrinkable fibres and low-temperature dyeing produces fibres

whose heat-shrink properties are maintained on natural ageing under room conditions over an extended period of time. In preparing the pile fabrics, different deniers of the heat-stable and heat-shrinkable fibres can be, for example, from 1 to 16 denier. In some cases, it may be necessary to use substantially different deniers for the two types of fibres to obtain the desired result.

The heat-stable fibres which are used in the pile fabrics together with the shrinkable fibres may be any of a wide variety of fibres such as heat-stable modacrylic fibres described in British Patent Specification No. 806,875, cotton, mohair, wool, viscose, heat-stable acrylo-nitrile homopolymers and copolymers such as those sold under the Registered Trade Marks Creslan, Acrilan, Dynel, Zefran, and Orlon, and linear terephthalate polyesters such as the linear cyclohexane-1,4-dimethanol terephthalate polyesters described in British Patent Specification No. 818,157 which have been heat-stabilized as described in the patent. Heat-stabilized glycol terephthalate polyesters, including polyethylene terephthalate, described in the U.S. Patent No. 2,465,319 are also very useful as the heat-stable component of high-pile fabric.

Dyes particularly useful for dyeing the heat-shrinkable fibres, particularly the modacrylic fibres described above, include cationic or basic dyes well-known in the art for dyeing acrylic fibres, for example the Basacryl series of cationic dyes which are usefully employed for dyeing acrylonitrile polymers such as Acrilan and Dynel at the boil, for example. Basacryl Yellow 5RL (C.I. Basic Yellow 25), Basacryl Red GL (C.I. Basic Red 29), Basacryl Blue 3RL (C.I. Basic Blue 53) and Basacryl Blue GL (C.I. Basic Blue 54); and the Sevron series of dyes including cationic cyanine, methine, anthraquinone, oxazine and triphenylmethane dyes such as Sevron Yellow L (C.I. Basic Yellow 13), Sevron Yellow R (C.I. Basic Yellow 11), Sevron Orange G (C.I. Basic Orange 21), Sevron Blue B (C.I. Basic Blue 21), Sevron Blue 2G (C.I. Basic Blue 22), Sevron Blue 5G (C.I. Basic Blue 4), Sevron Brilliant Red 4G (C.I. Basic Red 14) and Sevron Green B (C.I. Basic Green 3).

The following are representative of useful disperse dyes: 4-(2-methanesulphonyl-4'-nitrophenylazo)-N- β -acetoxyethylaniline; 4-(6-methanesulphonyl-2-benzothiazolylazo)-N- β -cyanoethyl- β -hydroxyethylaniline; 2-nitro-4-N,N-dimethylsulphonamido-4'-ethoxydiphenylamine; and 2-nitro-4-sulphonanilidodiphenylamine. Representative of useful pre-metallized dyes are: Cibalan Yellow 2BRL, C.I. Acid Orange 87, Cibalan Red 2GL, C.I. Acid Red 211, Cibalan Orange RL, C.I. Acid Orange 88, Cibalan Blue BL, C.I. Acid Blue 168, Cibalan Brown 2GL, no C.I. number, and Cibalan Grey 2GL, C.I. Acid Black 62.

The usual stock or package dyeing methods can be used for dyeing the heat-shrinkable fibres. Dyeing assistants and levelling agents such as non-ionic surfactants and phosphate compounds are useful as shown in the following examples.

Methods known in the art can be used for imparting the heat-shrink properties to the fibres. These methods include spinning the modacrylic fibres from solvent, passing the tow bundle over heated rolls and drafting the fibres to about 3 to 6 times their original length at a temperature of about 250–400° F. followed by cooling the fibres without relaxing or further heat treatment. A particularly useful method for imparting heat-shrinkage to the modacrylic fibres is to draft the fibres at a temperature of the order of 250–300° F. and spray with chilled water or pass them over a cool roll without relaxing or further heat treatment. When fibres such as the above modacrylic fibres are to be utilized as the heat-stable component of the high-pile fabric, they are drafted with heat and relaxed and heat-stabilized in accordance with the usual practice.

In preparing the high-pile fabric for which the above-mentioned dyed heat-shrinkable modacrylic or other shrinkable fibres are particularly adapted, the dyed fibres are combined into the high-pile fabric together with heat-stable fibres which may be selected from a wide variety of synthetic and naturally occurring heat-stable fibres such as mentioned above. Thereafter, the pile fabric composed of a mixture of the dyed heat-shrinkable modacrylic fibres and substantially non-shrinkable fibres can be sheared, napped and subjected to heat to differentially shrink the fibres and produce the high-pile fabric simulating natural fur. As mentioned previously, an especially useful combination of shrinkable and non-shrinkable fibres is a copolymer of vinylidene chloride and acrylonitrile modified so as to contain polymer chains containing N-alkylacrylamide units and these shrinkable fibres in combination with heat-stabilized, non-shrinkable fibres, e.g. terephthalate polyester, modacrylic and mohair fibres.

The accompanying drawings show in greatly enlarged cross-sectional view the appearance of a representative high-pile fabric of the invention before and after heating to differentially shrink the shrinkable modacrylic and heat-stable fibres. As shown in Stage 1 of the drawings, heat-stable fibres and dyed heat-shrinkable modacrylic fibres of uniform length susceptible to low temperature dyeing are combined on the knitted base 10 to produce a high-pile fabric. Upon heating of the fabric, the fibres undergo differential shrinkage and the fabric appears as shown in Stage 2 as a multi-pile fabric resembling natural fur, the heat-stable fibres appearing as guard hairs and the shrunken

modacrylic fibres appearing as the underfur of natural fur.

The following Examples illustrate the present invention.

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EXAMPLE I.

A modacrylic fibre was prepared as described in British Patent Specification No. 806,875, comprising a mixture of a copolymer of vinylidene chloride and acrylonitrile and a minor amount of a poly(lower N-alkylacrylamide), the fibre being drafted with heat and cooled without relaxing to impart high heat-shrinkage thereto, after which the tow was cut to staple length. Fifty pounds of this 3-denier-per-filament bright high shrinkage modacrylic fibre was dyed a silver grey shade in a Riggs and Lombard raw-stock dyeing machine. The machine was filled to three-fourths capacity with water which was heated to 80° F. The fibre was loaded into the water by hand and distributed evenly. The machine was filled to the correct volume with water and circulation of the water was begun. The following chemicals (amounts used calculated on weight of the fibre) were added to the machine and circulated for 10 minutes:

1.0% Acetic Acid (56%)
0.5% Sodium Acetate
1.0% Fatty Ester Sulphate
1.5% Self-Emulsifying organic phosphate

The following basic dyes (amounts used calculated on weight of the fibre) were pasted with acetic acid and dissolved in boiling water, then added to the dye machine and circulated for 10 minutes:

0.084% Basacryl Yellow 5RL
0.020% Basacryl Red GL
0.063% Basacryl Blue 3RL
0.02% Basacryl Blue GL

The temperature of the dye bath was raised from 80° F. to 140° F. over a period of 45 minutes. The fibre was dyed 60 minutes at 140° F. After this the dyed fibre was rinsed at 120° F., removed from the machine, and the excess water removed by a centrifugal extractor, and dried at 190° F.

A suitable fatty ester sulphate for use in this and the following dye baths is Aliphatic Ester Sulphate, product of Onyx Oil and Chemical Company. Other surfactants can also be used. A suitable organic phosphate to use in the dye baths is the Verel Dyeing Assistant, product of Eastman Chemical Products, Inc. Other known dyeing assistants can be used, the nature of which will depend in part upon the particular dye and the fibre in use.

The shrinkage of the fibre before and after dyeing can be determined by placing a given length in boiling water for two minutes followed by quenching with cold water and measuring the change in length. Similarly, dry heat at about 300° F. can be used to shrink the fibre before and after dyeing. Using such methods, the modacrylic fibre had about

45% shrinkage before dyeing and 34% after dyeing. 65

EXAMPLE II.

Example I was repeated, but using a dyeing temperature of 159° F. The retained heat-shrinkage of the fibre was about 33%. 70

EXAMPLE III.

Repeating Example I, using the dyeing temperature of 150° F., a pewter shade was dyed using the following dye formula:

0.18% Basacryl Yellow 5RL 75
0.053% Basacryl Red GL
0.037% Basacryl Blue GL
1.0% Acetic Acid (56%)
0.5% Sodium Acetate
1.0% Fatty Ester Sulphate 80
1.5% Self-emulsifying organic phosphate

The fibre, after dyeing and drying, was found to have 27% shrinkage.

EXAMPLE IV.

In the manner described in Example I, 50 pounds of the 3 denier-per-filament — 1½" bright high shrinkable modacrylic fibre was stock dyed to a brown shade. The fibre was then processed into a blend containing 60% 16 denier-per-filament—1½" bright heat-stable (non-shrinkable) modacrylic fibre of the same composition as the shrinkable fibre which had been dyed separately to a black colour, and 40% of the above stock dyed shrinkable fibre. The blend was put through a garnet and made into several ends of sliver. The sliver was fed into a Wildman pile knitting machine and knit into a fabric of approximately 28 ounces of fibre per square yard. The resulting pile fabric was combed and given a top shear. It was then passed through an oven at approximately 5 yards per minute at a temperature of about 300° F. Hold-up time in the oven was approximately 4 minutes. During this operation, the shrinkable fibre shrank and became stabilized providing two heights of pile. The fabric next went through a series of finishing steps involving heat polishing and shearing to obtain the final fur-like texture desired. The two-pile-height effect obtained by this process was similar in appearance to that obtained by using heat-shrinkable fibres not subjected to a dyeing operation. 115

EXAMPLE V.

Example IV was repeated except that the fibre was made into a blend of 55% of the above 3 denier-per-filament stock dyed shrinkable fibre and 45% 16 denier-per-filament—1½" bright heat-stable (non-shrinkable) modacrylic fibre of Example I which had been previously stock dyed dark brown. Knitting and finishing was similar to that used in Example IV. The shrinkage was developed by heating to between 290 and 300° F. In this case, about 32% shrinkage was obtained 125

as opposed to about 40% obtained by using fibre which had not been stock dyed.

EXAMPLE VI.

- Using the technique outlined in Example IV, three different colours of the shrinkable modacrylic fibre were stock dyed at temperatures below 160° F. Dye Formulae for:
1. Sapphire
 - 10 1.80% Basacryl Blue GL—C.I. Basic Blue 54 (Supplement)
 - 0.39% Basacryl Red GL—C.I. Basic Red 29 (Supplement)
 - 0.64% Basacryl Yellow 5RL—C.I. Basic Yellow 25 (Supplement)
 - 15 1.0% Acetic Acid (56%)
 - 0.5% Sodium Acetate
 - 1.0% Fatty Ester Sulphate
 - 6.0% Self-emulsifying organic phosphate
 2. Navy
 - 20 2.32% Basacryl Blue GL—C.I. Basic Blue 54 (Supplement)
 - 0.73% Basacryl Red GL—C.I. Basic Red 29 (Supplement)
 - 1.78% Basacryl Yellow 5RL—C.I. Basic Yellow 25 (Supplement)
 - 25 1.0% Acetic Acid (56%)
 - 0.5% Sodium Acetate
 - 1.0% Fatty Ester Sulphate
 - 6.0% Self-emulsifying organic phosphate
 - 30 3. Mist Grey
 - 0.023% Basacryl Blue GL—C.I. Basic Blue 54 (Supplement)
 - 0.021% Basacryl Red GL—C.I. Basic Red 29 (Supplement)
 - 35 0.075% Basacryl Yellow 5RL—C.I. Basic Yellow 25 (Supplement)
 - 1.0% Acetic Acid (56%)
 - 0.5% Sodium Acetate
 - 1.0% Fatty Ester Sulphate
 - 40 1.5% Self-emulsifying organic phosphate
- The fibre was made into a yarn for woven coat fabrics. The fibre was blended with 25% mohair and spun into a 1/28 worsted count yarn. It was then woven on a plush loom into a pile coat fabric. Temperatures between 280° and 300° F. were then used to shrink the modacrylic fibre portion of the fabric. The pile of the fabric was then laid by heating the fabric and passing it face down over rollers while still hot. The resulting fabric had a definite two-pile height effect and a pleasing fur-like texture.

EXAMPLE VII.

- Following the dyeing procedure outlined in Example I, 50 pounds of 3 denier-per-filament—1½" bright high-shrinkage modacrylic fibre was stock dyed a black shade with cationic dyes. 60 pounds of 15 denier-per-filament low shrinkage, bright lustre, 1½" cut of cyclohexane-1,4-dimethanol terephthalate polyester heat-stable was stock dyed black. 40 pounds of the stock dyed black shrinkable fibre was blended with 60 pounds of the other

stock dyed fibre. This blend was garneted and made into several ends of sliver. The sliver was fed into a Wildman pile knitting machine and knit into a fabric of approximately 30 ounces of fibre per square yard. The pile fabric was brushed and top sheared. Then it was passed through an oven at approximately 5 yards per minute at a temperature of 290° F. to 310° F. Hold-up time in the oven was approximately 4 to 6 minutes. This treatment caused the shrinkable fibre to shrink and become stabilized providing two heights of pile, since the heat-stable fibre did not shrink. Next, the fabric was heat-polished and sheared to obtain a fur-like texture.

EXAMPLE VIII

Example IV was repeated using 16 denier-per-filament low crimp 1½" cut heat-stable acrylic polymer staple (at least about 85% combined acrylo-nitrile units) in place of the modacrylic heat-stable fibre. A two pile height fur fabric effect was obtained after finishing.

EXAMPLE IX

A blend of 50% — 3 denier-per-filament 2½" bright shrinkable modacrylic fibre of Example I and 50% of non-shrinkable 16 denier-per-filament 2½" bright fibre of the same composition was spun into an 8/1 yarn and made into a loop pile fabric with a ¼" pile height on a ¼" gauge tufting machine. The resulting fabric was piece dyed and finished in the same manner as in Example VII to provide an imitation fur coat fabric.

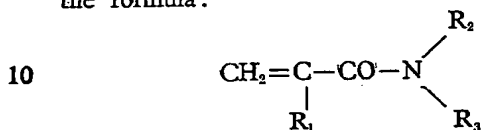
Reference is made in Examples IV and VII to the use of a Wildman pile-knitting machine. An alternative procedure to produce a pile fabric which may be employed is to use the raschel cut-pile method. Further, a yarn containing the two fibres may be knit or tufted and the fabric dyed at low temperature, napped, sheared, heated and heat-polished to produce a multi-pile fur-like fabric.

Our copending Application No. 26,878/65 (Serial No. 1,116,925), from which the present application is divided, relates to a process for preparing a composite yarn which contains heat-shrinkable and heat-stable fibres, and to the use of such a yarn in the preparation of a high-bulk fabric.

WHAT WE CLAIM IS:—

1. A process of dyeing textile fibres, which comprises dyeing heat-shrinkable fibres of an acrylonitrile polymer at a temperature below 160° F.
2. A process as claimed in Claim 1, in which the acrylonitrile polymer contains from 35 to 95% of acrylonitrile units and from 65 to 5% of polymer units rendering the acrylonitrile polymer capable of being dyed at temperatures below that which causes substantial shrinkage of the polymer.

3. A process as claimed in Claim 1, in which the acrylonitrile polymer contains (A) 70 to 95% by weight of a copolymer containing 30 to 65% by weight of vinyl chloride or vinylidene chloride and 70 to 35% by weight of acrylonitrile, and (B) 30 to 5% by weight of a polymer which is either (1) a homopolymer of an acrylamidic monomer of the formula:



- wherein R_1 is hydrogen or methyl, and R_2 and R_3 are each hydrogen or an alkyl group of from 1 to 6 carbon atoms, or (2) a copolymer of at least two acrylamidic monomers of the above formula, or (3) a copolymer consisting of at least 50% by weight of at least one acrylamidic monomer of the above formula and not more than 50% by weight of a polymerisable monovinyl pyridine monomer.

4. A process as claimed in Claim 3, in which the acrylonitrile polymer contains (A) 70 to 95% by weight of a copolymer of 30 to 65% by weight of vinylidene chloride and 70 to 35% by weight of acrylonitrile, and (B) 30 to 5% of poly-N-iso-propylacrylamide.

5. A process as claimed in anyone of the preceding claims, in which, after dyeing, the fibres are dried at a temperature between 180° F. and 220° F.

6. A process as claimed in any one of the preceding claims, in which the heat-shrinkable fibres are prepared by preparing fibres of the acrylonitrile polymer and then heating, draft-

ing, and cooling the fibres without relaxing or further heat treatment.

7. Dyed heat-shrinkable fibres whenever formed by a process as claimed in any one of Claims 1 to 6.

8. A process for preparing a high-pile fabric wherein dyed fibres as claimed in Claim 7 are combined with heat-stable fibres into a pile fabric and the pile fabric is heated to cause substantial shrinkage of the heat-shrinkable fibres.

9. A process as claimed in Claim 8 in which the pile fabric is heated to a temperature of from 250 to 300° F.

10. A process as claimed in Claim 8 or 9, in which the heat-stable fibres are dyed before being combined with the dyed heat-shrinkable fibres.

11. A high-pile fabric whenever made by a process as claimed in any one of Claims 8, 9 or 10.

12. Processes of dyeing textile fibres as claimed in Claim 1 and substantially as hereinbefore described.

13. Dyed heat-shrinkable fibres whenever formed by any process as claimed in Claim 12.

14. A process for preparing a high-pile fabric wherein dyed fibres as claimed in Claim 13 are combined with heat-stable fibres into a pile fabric and the pile fabric is heated to cause substantial shrinkage of the heat-shrinkable fibres.

15. A high-pile fabric whenever made by a process as claimed in Claim 14.

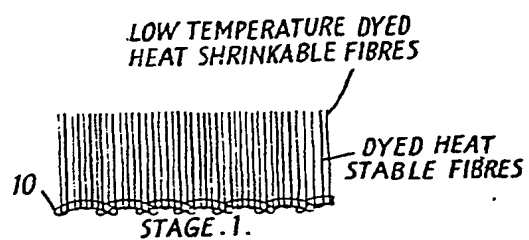
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COMPLETE SPECIFICATION

1 SHEET

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the Original on a reduced scale



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HEAT

